

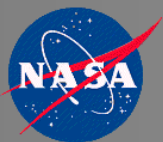


Reuse Working Group Breakout #2 – Decadal Survey Missions

8th Earth Science Data Systems Working Group Meeting
Wilmington, Delaware
October 20–22, 2009



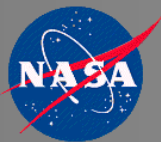
Introduction and Recap



Near-Term Missions (2010–2013)

Decadal Survey Mission	Mission Description	Orbit	Instruments	Rough Cost Estimate (FY06 \$million)
CLARREO (NASA portion)	Solar and Earth radiation; spectrally resolved forcing and response of the climate system	LEO, precessing	Absolute, spectrally resolved interferometer	200
SMAP	Soil moisture and freeze-thaw for weather and water cycle processes	LEO, SSO	L-band radar L-band radiometer	300
ICESat-II	Ice sheet height changes for climate change diagnosis	LEO, Non-SSO	Laser altimeter	300
DESDynI	Surface and ice sheet deformation for understanding natural hazards and climate; vegetation structure for ecosystem health	LEO, SSO	L-band InSAR Laser altimeter	700

NOTES: Missions are listed by cost. Colors denote mission cost categories as estimated by the committee. Pink, green, and blue shading indicates large-cost (\$600 million to \$900 million), medium-cost (\$300 million to \$600 million), and small-cost (<\$300 million) missions, respectively. LEO = low Earth orbit; SSO, Sun-synchronous orbit.



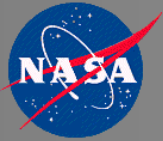
Decadal Survey Missions and Reuse (1/3)

If we were to do EOS over again, what would we have done differently?

- Implement a mission and algorithm software (and documentation) repository
 - Current repository is distributed (STs, Data Centers, SIPS, etc.)
 - A set of best practices for reuse should be developed and evolved into standards and policies.
 - Is there a best practices document for software reuse (e.g., bottom-up guidelines on portal)?
 - Science community needs to be on the same wavelength
 - Need to involve data systems folks in the discussion of future planning for data system policies
- Don't be so ambitious – too many promises about great leaps forward
- Spend more of overall mission budget on data system development (not just paper) – algorithm development will cost more and take longer than expected
- Overall structure should be less monolithic
 - It started that way but became more distributed (i.e., SIPS), but this may have had a detrimental impact on preserving algorithms and software
 - The requirements for the SIPS should include requirements for preserving (and delivering) algorithms and software
- It will be a few years after launch before good quality data is produced and algorithm (and software) revisions will be needed for the life of the mission
- Algorithm documentation needs to be updated before/after major changes to the software
- Standards and protocols are needed for preserving algorithms and software in a distributed system
- **Future reuse (persistent use) is important**

What role should Service Oriented Architecture (SOA) and other new technologies play?

- Cloud computing should be considered as an option
 - But data ownership and control is an key issue
 - There are large potential cost savings, but we need to be aware of other risks
 - Service level agreements (SLAs) may be needed
 - Cloud computing could be done within (internal to) NASA
- If done right, SOA will have a large cost savings in the future
 - But raises new issues (risks), such as provenance issues
 - Trust but verify (often): science testing in a known environment (to verify SOA results) is needed to produce good quality products
- Verification of correct results from SOA is different and more difficult
 - Many more independent changes are possible
 - Different approach to verification may be needed (self checking)
- Reproducibility could be a problem – how do you later reproduce a production run after versions of any/all intermediate steps have changed?
 - This could be handled by “snap shots” of end-to-end change at specific points in the process.
- Preserving the software (for persistent use or future reuse) is more difficult.

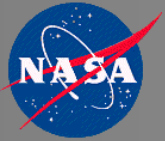


What should be done to prepare for the decadal survey missions?

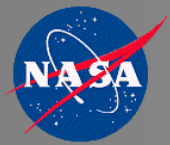
- Reproducibility issue
 - Input data from outside organizations being used in the algorithm needs to be preserved (either by outside organization or internally)
 - This is also an issue for current systems
- Reuse Enablement System(s)
 - Either central or distributed should be established
 - Links are needed between distributed RESs
- Linkages between data and software to produce data (provenance) should be established and maintained
- Open Source software should be used whenever feasible
 - Helps with preservation of software Because of the risks of proprietary software
- Policies for use of web services may need to be established
 - With respect to software and algorithm capture and preservation
- New process for prioritization of algorithms and data sets is needed (community vetted)
- What are the high leverage points (in terms cost and schedule) for software reuse in the decadal survey missions?
 - Studies are needed to figure this out.



Discussion



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- WG's role in decadal survey and other future missions?
 - How can reuse support (preparation for) future missions?
 - How does current work (e.g., RES and RRLs) apply?
 - How can the WG identify opportunities for reuse in future missions?
 - What general and specific activities should we pursue, in 2010 and beyond, to plan for decadal survey missions?
 - Frank has indicated some missions are dubious about whether NASA will really do reuse and benefit from it – what can the WG do about this?



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